Nebraska Energy Quarterly

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NDEE participates in Wind and Solar Conference

The Nebraska Department of Environment and Energy attended the 14th annual Wind and Solar Conference and Exhibition on Nov. 8-9.

The Wind and Solar Conference provides information on wind and solar development in Nebraska. It organizes sessions and workshops for speakers and moderators to provide the latest information on the industry, according to a conference press release. Attendees include public power representatives, private sector developers, public officials, landowners, environmental interests, wildlife interests and the public at large.

NDEE Director Jim Macy spoke at the conference and gave an overview of wind and solar developments that are currently in operation across the state. Maps with that information were also available as handouts for attendees.

Aaron Miller, NDEE's grants section supervisor who also serves on the conference's planning committee, also gave an overview of the Volkswagen Environmental Mitigation Trust Funds NDEE administers and the electric vehicle charging stations the trust has been able to fund. He said the agency also had a booth at the event. The booth promoted NDEE's Dollar and Energy Saving Loans program and provided information on wind and solar capacity throughout the state.

The DESL program provides low interest loans for a variety of energy efficiency projects. These loans can be used for home and business improvements, as well as wind, solar and fuel cell systems.

Photo by Sarah Starostka, NDEE

NDEE's Energy Conservation Loan Program Coordinator Shawna Orth runs the agency's booth at the Wind and Solar Conference to provide information on NDEE's Dollar and Energy Saving Loans program.

"This year we tried to give more information on residential solar installations," Miller said.

According to the Wind and Solar Conference press release, other topics of discussion included the renewable energy portions of the recently passed federal infrastructure package, utility-scale battery storage, improving grid resilience, hydrogen generation, planning and zoning regulations and more.

The Wind and Solar Conference has posted this year's presentations online. Presentations from 2021 and past years can be found on the conference's website.

Miller said not only does the Wind and Solar Conference give NDEE a chance to provide information about its programs, it also provides a chance for the agency to learn more about the wind and solar industries.

"It also helps the public become more aware of the state of solar and wind energy in the state of Nebraska," Miller said. "It helps people understand how renewable energy impacts energy production."

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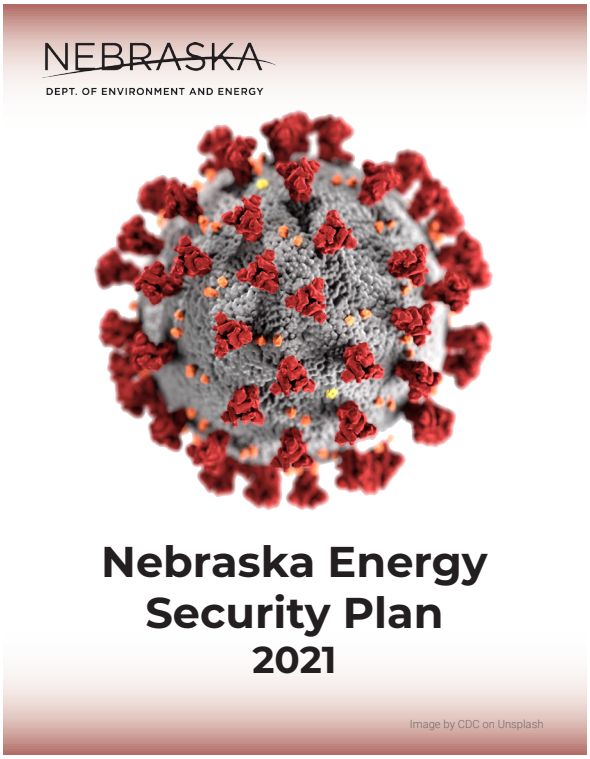
Energy security plans can help municipalities prepare for emergencies

Energy security and the Emergency Support Function (ESF) 12 go hand in hand. Both are about ensuring energy supplies. Energy security is an everyday goal, and ESF 12 coordinators work with the Nebraska Emergency Management Agency (NEMA) in training sessions, emergency exercises and incidents to ensure energy continuity.

Energy security involves both responding to energy supply disruptions and, in the longer term, working to enhance the resiliency of energy infrastructure, according to NDEE Statistical Analyst Doris Jansky.

"The goal of energy security planning is to achieve a robust, secure, and reliable energy infrastructure that is also resilient," Jansky said.

Jansky also serves as an ESF 12 coordinator for energy. ESFs focus on different aspects of critical infrastructure. ESFs can be activated by the NEMA to coordinate emergency response.



Energy security planning ensures officials can respond quickly in the case of an emergency, as well as plan for the future resiliency of their municipality's energy infrastructure.

Energy Security

The tool that is a big part of energy security is the energy security plan, previously referred to as an energy assurance plan. Energy security plans exist to help jurisdictions respond to energy supply disruptions and plan ahead to enhance the resiliency of their energy infrastructure.

Jansky said it's important to have an all-hazards energy security plan in place before an incident occurs. The plan also includes having relationships formed with key organizations. With the response steps and relationships in place, less time is wasted in an emergency situation.

The ESF 12 team collects information on energy prices, fuel supply inventory, stakeholder requests and other actions needed by NEMA and takes the lessons they've learned to maintain the state's energy security plan, Jansky said.

ESF 12

Jansky said she and the other ESF 12 coordinators monitor energy prices and fuel supplies regularly and maintain an energy data repository, which ties into the state's energy security plan as well as the ESF 12 work. If there is an emergency incident, the coordinators are responsible for ensuring fuel supply, helping with tasks assigned to them by NEMA and alerting NEMA to emergency needs from the energy sector.

"Emergencies start at the local level," Jansky said.

Each local jurisdiction should have an energy security plan. NDEE plans to conduct workshops next year to assist local officials and emergency managers to write their energy security plans. Jansky added that this training is made available through the State Energy Program.

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A primer on electric vehicle charging

Charging type can affect time at the plug

by Randy Smith
Environmental Specialist, NDEE

Photo by Amanda Woita, NDEE

Currently, there are three types of charging available to electric vehicle drivers—Level 1, Level 2, and DC Fast Chargers. Each can affect the time it takes to charge an EV.

Consumer interest in electric vehicles (EVs) is growing as manufacturers introduce a wider variety of plug-in hybrid and battery-electric models, including pickup trucks and SUVs. More of the new EVs are "extended range" models with larger battery packs providing 300 miles of driving between charges. Before you buy an EV, you should understand the different options available for charging.

The time it takes to recharge an EV battery pack depends on its capacity, state of charge and the charging rate. Charging time for a depleted battery can vary from less than 20 minutes to 20 hours or more, depending on which of three types of charging equipment is used.

Level 1 Charging
Most, if not all, plug-in EVs include a cordset that can be plugged into a standard household electrical outlet on a 120-volt alternating current (AC) circuit. Known as Level 1 charging, this method can provide 2 to 5 miles of driving range per hour charging. This is the slowest method of charging.

Level 2 Charging
Level 2 charging equipment delivers 240-volt alternating current to the vehicle, providing 10 to 60 miles of driving range per hour charging. All current EVs can accept Level 2 charging. You can purchase a consumer Level 2 charger for your garage, allowing you to fully charge an extended-range battery overnight. "Smart" Level 2 home chargers allow you to schedule charging to avoid times of high demand when your electric utility may be charging more for electricity. There are also many commercial Level 2 chargers installed for public use in parking garages, curbside parking places, and at retail stores and restaurants.

Most home Level 2 chargers are designed to be hard-wired to a 240-volt circuit (the type needed for an electric dryer or stove), so a qualified electrician should install the unit and may need to upgrade the electrical connection to your garage or install an outdoor unit.

DC Fast Charging
EV battery packs operate on direct current (DC). During Level 1 or Level 2 charging, a built-in charger in the EV converts the electricity being supplied from AC to DC to charge the battery pack. A DC fast charger supplies DC power directly to the battery, bypassing the on-board charger. DC fast chargers are used in high-traffic public and commercial locations to provide rapid charging: 60 to 80 miles of driving range per 20 minutes of charging. Because of their power requirements, they are not available for home use. DC charging ports are now standard

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(or an extra-cost option) on new EVs, but many older EVs are not equipped for DC fast charging.

The power output of DC fast chargers currently ranges from 50 to 350 kilowatts (kW), with higher power providing the potential for faster charging. However, the EV's battery management system sets the rate of charge, and the maximum charging rate varies widely among current EV models, from 50 kW for the Chevy Bolt to 270 kW for the Porsche Taycan. The new extended-range EVs coming to the market are designed to accept the faster charge provided by the more powerful DC chargers.

An EV's battery management system also varies the charging rate during a charging session depending on the battery's state of charge. The charging rate is slower at a low state of charge and as the charge state approaches the battery's capacity. These changes are made to extend the life of the battery.

In addition to the charging equipment used, vehicles and plugs also have different connectors. These different connectors will be discussed in the next issue of the Nebraska Energy Quarterly.

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EIA expects short-term crude oil prices to remain lower than highs of 2021

Information from the Energy Information Administration

The U.S. Energy Information Administration (EIA) forecasts that global oil production will increase more quickly than demand in 2022, pushing crude oil and petroleum product prices lower than in late 2021. Brent crude oil prices averaged $81 per barrel in November, but they closed the month at $70 per barrel.

In its December Short-Term Energy Outlook (STEO), EIA forecast Brent crude oil prices will average $70 per barrel in 2022.

Responses to the new COVID-19 Omicron variant could lead to a decline in demand for petroleum products in the near term.

“This is a very complicated environment for the entire energy sector,” said EIA Acting Administrator Steve Nalley. “Our forecasts for petroleum and other energy prices, consumption and production could change significantly as we learn more about how responses to the Omicron variant could affect oil demand and the broader economy.”

The STEO forecast also reports that the release of crude oil reserves by the United States and other countries may have contributed to the decrease in Brent crude oil prices in November, and that decrease could contribute to lower prices in 2022.

Addtionally, U.S. gasoline prices averaged $3.39 per gallon (gal) in November, the highest monthly average since September 2014. EIA expects retail gasoline prices to average $3.13/gal in December and to average $2.88/gal in 2022.

“Our forecast for increased crude oil production suggests some decrease in prices at the pump over the next year,” Nalley said.

EIA forecasts U.S. coal production to reach nearly 621 million short tons in 2022, a 16% increase from 2020. Even with increased production, EIA expects U.S. coal inventories in the electric power sector to decrease by more than 50% from 2020 to 2022.

“Demand for coal has grown significantly in the United States and globally this year as coal has become more competitive with natural gas for electricity generation,” Nalley said.

The Short-Term Energy Outlook is available on the EIA website.

Photo by Michael Marcon on Unsplash

In its December Short-Term Energy Outlook, the Energy Information Administration expects oil production to increase, keeping prices lower than the highs of late 2021.

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Nebraska by Numbers

American Clean Power tracks data on each state's renewable power industry and provides that information on its website. The information below shows how Nebraska compares to the nationwide average.

Income to farmers, ranchers and other private landowners through clean power projects

Nebraska—$4.8 million

National total—$904.7 million

Jobs within the clean power industry

Nebraska—2,100 people

National average—415,000 people

Metric tons of carbon dioxide emissions avoided using renewable energy and energy storage

Nebraska—7,133,000 metric tons, the equivalent of taking 1,550,000 cars off the road

National total—374,074,000 metric tons, the equivalent of taking 81,320,000 cars off the road

Water consumption avoided by using renewable energy and energy storage

Nebraska—3 billion gallons

National total—268 billion gallons

Homes that can be powered by clean energy

Nebraska—734,000

National total—52.2 million

Clean power's investment in local communities (property, state and local taxes)

Nebraska—$28.1 million

National total—$1.8 billion annually

Operating wind, solar and energy storage capacity

Nebraska—2,688 MW, or 22nd in the nation

National total—186,674 MW

Share of all electricity produced that comes from wind, solar, and energy storage power plants:

Nebraska—24.94%, or 10th in the nation

National average—11.27%

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Agrivoltaics — A potential practice for Nebraska's farmers and ranchers

by Andrew Hug
Environmental Specialist, NDEE

Over the past 20 years, farmers and ranchers who want to lease some of their land for large-scale solar production have had two options.

The first option is to build an older-style solar farm where the land is cleared of vegetation and planted to turf grass or graveled. The second option is to plant a mix of prairie grasses and flowers underneath and around the solar panels. This creates a more pleasant-looking site, provides pollinator habitat, controls erosion and builds the soil.

Photo by Michael Wilson on Unsplash

Solar panels like these can be used in agrovoltaics, which merge agriculture with photovoltaics. Research has shown that the shade provided by solar panels can be beneficial to specialty crops by reducing heat and excess light stress and decreasing evaporation from the soil.

While those approaches offer serious financial benefits to an operation, a third option is becoming available – agrivoltaics. Agrivoltaics merge agriculture and photovoltaics, so the land produces food, feed and electrons much like a modern corn field produces food, feed and ethanol. Commercial agrivoltaics production is relatively new but is taking place in the United States, Europe and elsewhere around the world. Below are some of the benefits agrivoltaics can provide.

Panels Benefit Crops

Research shows that agrivoltaics improves yields on a wide variety of specialty crops including tomatoes, chiltepin peppers, jalapeño peppers, celery, potatoes, lettuce, spinach, beets, carrots, pasture grasses, barley, grapes, pears, blueberries, kale, chard and broccoli, many of which could be commercially grown in Nebraska, diversifying operations. One farm in Colorado had been growing hay for generations, but has started a variety of crops using agrivoltaics. Not only do yields increase, but quality can improve, as well.

Shade is one reason why yields improve with agrivoltaics. Many specialty crops exceed their light saturation point when exposed to the sun all day, which stresses and harms the plant. Midday shade from solar panels reduces that stress, like providing shade to people working in the hot sun so they can avoid heat stroke.

Solar panels also prevent soil drying, which saves irrigation water and benefits the crops by increasing water use efficiency, increasing humidity, decreasing midday temperatures and increasing nighttime temperatures. The soil also benefits from reduced wind and water erosion.

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Crops Benefit Panels
Research has shown that plant transpiration cools solar panels, which improves their productivity. Solar panels are generally designed to operate best at about 77° F and in one university experiment, the plants cooled the panels 9° F, improving their efficiency by 4.5%. This is backed by work at Oregon State University, among others.

Corn, Livestock and Agrivoltaics
A major question is whether agrivoltaics can be applied to field corn. Because corn has among the highest light saturation points and uses a particularly efficient form of photosynthesis, shade would rarely benefit it. However, farmers may be able to install solar panels where they have implemented NRCS 30-foot prairie strips. Panels deployed over the strip could provide a revenue stream to offset the cost of the prairie strip.

One possible adaptation for crops like corn or soybeans has already undergone field experimentation in Germany. They suspend solar panels on cables five to six meters above ground on a 32 by 32 meter plot or an equivalent size rectangle using only four support posts, which reduces issues for large farm equipment and improves overall cost by reducing the need for steel in the support structure.

Agrivoltaics can also benefit livestock. Raised solar panels can provide valuable shade, much like shade cloths, which can cost thousands. Multiple 30 by 30 foot sets of solar panels owned by an energy company costs ranchers nothing, and they produce revenue in addition to shading the cattle. Considering a 30 by 30 foot solar panel generates about 18 KW, a farmer-owned set of panels could supply the energy needed for a set of hog or chicken barns.

Full Circle Independence
Agrivoltaics provide an opportunity to bring agriculture full circle when it comes to energy inputs. In the 1920s, farmers used the sun's energy to grow close-grown crops such as oats and barley to fuel their draft horses and mules using over a fourth of their land. Farms can once again become largely sun powered – except today it will take just a few percent of an operation's land to accomplish the same work. Additional energy independence is coming as engineers at John Deere, Case IH and other ag equipment manufacturers continue to perfect electric tractors and other farm-scale equipment. Solar energy may power field work again, just like it did for great-grandfather.

Ongoing Support and Research
Those looking for more information on agrivoltaics will find resources and research are increasing. For example, with funding from the U.S. Department of Energy, the National Center for Appropriate Technology has recently established the AgriSolar Clearinghouse to supply a library of news and peer-reviewed information.

In June 2021, the New Jersey legislature passed an act to establish a Dual-Use Solar Energy Pilot Program for farmland and it funded agrivoltaics research by the New Jersey Agriculture Experiment Station.

University of Illinois researchers, together with partners at Colorado State University and the University of Arizona, won a $10 million, four-year USDA grant to study optimal agrivoltaic designs.

Experiments are underway at North Carolina State for see-through solar panels that harvest specific wavelengths and allow the rest through to the plants below.

Research from the AgriVoltaics 2020 Conference and Exhibition has been posted by the American Institute of Physics with postings from the 2021 conference pending as of this writing.

The U.S. DOE InSPIRE project has established agrivoltaics research sites throughout the country to study the mutual benefits between solar panels and native plants while universities and corporations worldwide continue to research crop benefits, all of which will expand agrivoltaics options for Nebraska producers.

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NDEE speaks to Future Problem Solvers

by Amanda Woita
Public Information Officer, NDEE

Photo courtesy ESU 9

NDEE's Federal Aid Administer Ed Holbrook gave a presentation on energy benchmarking for Hastings and Aurora students Nov. 3.

The Nebraska Department of Environment and Energy recently helped students from Hastings and Aurora with a problem-solving project and hoped to inspire them to take their new knowledge of energy even further.

On Nov. 3, Educational Service Unit 9 in Hastings hosted a Future Problem Solvers Seminar, where NDEE's Federal Aid Administer Ed Holbrook discussed energy benchmarking and how it can save energy and money and reduce a building's carbon footprint.

Laura Ochsner, ESU 9's teaching and learning coordinator, said the students from Hastings and Aurora are taking part in the Future Problem Solving Program (FPS). FPS assigns topics for students to review and identify a problem and its challenges and brainstorm solutions. FPS provides three topics throughout the year – two for practice and one for a qualifying round which could send the students on to the FPS international competition.

Ochsner said ESU 9 prepares seminars on each topic to help the students with their FPS projects.

"I think the biggest takeaway is the problem solving, critical thinking and brainstorming skills the students learn," Ochsner said. "They gain skills they'll use for the rest of the lives."

The current topic is Building Green, which focuses on a variety of possibilities for new construction, including incorporating trees and plants, reducing emissions, conserving energy, using new building materials, incorporating renewable energy and innovating the function of buildings.

Holbrook focused his presentation on energy benchmarking, which is taking stock of a building's energy use and costs to collect baseline data. That way, if the building manager decides to implement energy-saving measures, he or she has a benchmark to see how those changes affect energy efficiency and the energy bill.

"You can't manage what you don't measure," Holbrook said.

Holbrook said NDEE has worked for several years to bring energy benchmarking into classrooms. In 2016, the agency received funding from the U.S. Department of Energy and worked with the University of Nebraska at Omaha to build an energy benchmarking curriculum called Nebraska Initiative-Benchmarking and Beyond, or NIBB. Included in the curriculum was an opportunity for students to benchmark a building in their community using the

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EnergySTAR Portfolio Manager.

The NIBB curriculum was shared with Nebraska educators to help them introduce energy topics int the classroom, but the ESU 9 seminar was a way for NDEE to bring the information directly to students.

"We want to encourage students to think about this concept because buildings use 40% of the energy that's consumed in the U.S." Holbrook said. "We want to show them, over time, if you can make energy efficiency improvements, you can provide benefits."

For example, Holbrook told the students that K-12 schools in the U.S. spend more than $8 billion on energy each year, but as much as 30% of energy consumed in schools is wasted. By conducting energy efficiency benchmarking and implementing changes, Holbrook said building managers can reduce a structure's carbon footprint and save money. He also said when an old heating, ventilation and air conditioning unit has been replaced, absentee rates improve because of the health benefits proper HVAC systems can provide.

Holbrook said he was glad to meet with the students, and hopes the information helps them think about energy differently or inspires them to investigate energy as a future career.

"It was an opportunity to directly relate to the young people about something we feel is an important topic for the future," Holbrook said. "There are many ways we can contribute positively to the future – what better way than to present to the students themselves?"

Photo courtesy ESU 9

Students from Aurora and Hastings attended a Future Problem Solvers seminar hosted by Educational Service Unit 9 on Nov. 3. Future Problem Solvers is a program that presents scenarios for students to identify problems and find solutions. NDEE's Ed Holbrook presented information on energy benchmarking to help the students with their "building green" scenario.

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Prepare your home for winter weather

Information from the U.S. Department of Energy

As winter settles in, it's not too late to prepare your home for colder weather. Doing so can even saving you money on your next energy bill.

The U.S. Department of Energy recommends taking these steps to get your home ready for winter and save energy.

1) Solar heating
If you have southern exposures in your home, open curtains on your south-facing windows during the day. That allows sunlight to heat your home, reducing the effort your furnace has to make (even if you turn down the thermostat—see tip #3). Just be sure to close the curtains at night, so you reduce the chilling effect from cold windows.

2) Cover drafty windows
Get a heavy-duty, clear plastic sheet or film from a do-it-yourself store. Tape it over the inside frame of your windows, and make sure it's sealed all the way around. If you can feel any air blowing in, tape up that spot. By keeping cold air from blowing in, you'll prevent your heater from working overtime.

Photo by Toa Heftiba on Unsplash

There are several ways to save on your energy bill this winter, including opening curtains on south-facing windows during the day to heat your home, and covering drafty windows with a plastic sheet.

3) Adjust the temperature
You probably have heard this one before, but it bears repeating. When you are home and awake, set your thermostat as low as is comfortable, and then turn it down lower when you go to sleep or leave for the day. You can save up to 10% on your heating bills. If you have a programmable thermostat, you can set it to do all the work for you.

4) Find and seal leaks
Your home probably has more holes in it than you think it does. Plumbing pipes, gaps around chimneys or vents, and even recessed lights in the ceiling often have spaces that allow air into the house from outside. Seal these up and you'll reap the dividends. While you're at it, you can (and should) also wrap insulation around any exposed water pipes outside; it will help keep them from freezing up.

5) Lower your water heating costs
Did you know that water heating accounts for almost one-fifth of the energy used in your home? Between cleaning dishes, washing clothes, and taking showers, we use a lot more energy than we might realize. Here's how to save: Turn down the temperature of your water heater to the warm setting (120°F). It will get you, your clothes, and your dishes just as clean, but cost you less.

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6) Lower your holiday lighting costs
Depending on how many lights you string for the holidays, your energy bill can be an unwelcome discovery in your stocking. Use light-emitting diode (LED) holiday light strings to reduce the cost of decorating your home for the winter holidays.

You can find all about how to do these tips, plus a lot more, on DOE's Energy Saver website.

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